

## ON THE ADINETADÆ, WITH DESCRIPTION OF A NEW SPECIES.

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## PLATE XI.

(Read September 16th, 1892.)

Among the numerous species of Rotifera which I find in washings of various mosses gathered from different localities and positions of growth, no one form is of such general occurrence as *Adineta vaga*. It is not, however, one of those species which, so far as we yet know, are only to be found in what we may conveniently term moss-habitats, as it occasionally occurs in pond-dippings, yet in my experience invariably in limited numbers. But in moss-washings it is almost always present, frequently abundant, and this fact suggests that this species, like so many others of the Bdelloida, has special structural and constitutional characters, which enable it to flourish better amid the conditions of life obtaining in moss-habitats than in the open waters of pools and ditches.

As a Bdelloid, its most noticeable character is the form of the ciliary organs. In place of the stout head and the prominent pair of pedicelled discs bearing the ciliary wreaths, or wheels, so conspicuous in the Philodinadæ when swimming or feeding, *Adineta vaga* has the ciliary wreath modified to a mere furring of the ventral surface of a much-flattened head, a furring which is exposed when the creature is travelling about, by means of which it creeps, and which is not adapted for swimming, but only for such creeping. If by chance dislodged from any raised surface on which it is travelling, it must fall through the water until arrested by the bottom or some obstacle whereon it can again gain foothold. It must, therefore, seek its food either on the bottom or on any surface which it can reach without swimming. It is possible that this, to some extent, may account for its supposed rarity, as the

usual methods of collection are not adapted to secure many bottom-feeding forms. It is more likely that its inability to swim handicaps it very seriously in the struggle for existence in pools and ditches, and especially in such as have but a scanty supply of weeds, and that in such places it is actually scarce as a natural consequence.

This same inability to swim is not, however, a serious matter to a creature whose existence is passed where a plentiful supply of water is only occasionally present, and would be of still less importance where the supply of moisture is commonly limited to a thin film covering the stems, or drops lodging in the axils of the leaves, as is the case with many mosses. Besides, if unable to swim, this *Adineta* can move along at a rapid rate, half-gliding, half-creeping, the body, as well as the head, being now flattened and appressed to the surface on which it is creeping. This flattening of the head and body enables it to travel and to feed in a thin film of water too shallow to allow the stouter *Callidinæ* to pass, far less to gather food.

The modified corona is not able to attract remote food particles, but can only gather in such as are actually within touch, and the animal has further acquired a peculiar method of feeding. Attaching itself by its toes, it extends itself to full length, keeping the face applied to the opposing surface, and gathering in all available particles, then, suddenly pulling itself back, it again extends in a new direction, and, in this way, without shifting its base, it gathers the food from a circular area, moving on at intervals to commence a new series of extensions. In this habit, peculiar to the limited family of which it is the most common representative, I seem to trace the result of feeding in a restricted area, where food is scarce and where every particle must be utilized.

Thus, the characteristic arrangement of the cilia, while probably detrimental to the existence of the species in pools and ditches, is distinctly advantageous to it in certain moss-habitats.

There are, however, many of the *Notommatadæ* whose cilia are also arranged upon a face more or less prone and flattened, and which commonly feed while crawling about. In these cases the cilia have usually sufficient power both to attract to

the mouth, when feeding, particles not lying directly in the path, and, when swimming, to propel the animal at a fair speed. Such animals should, in moss-habitats, be able to creep about and compete with *Adineta* for its food supplies, and, perhaps, outstrip it there, as they and other free-swimming forms have done in the open waters, and it is true that in mosses which habitually grow in wet positions, such as *Sphagnum*, many of such species do occur. Where, however, the moss grows in a position usually dry, and is dependent for moisture upon showers or falling dews, they are rarely met with, and it is obvious that they cannot endure the alternations of moisture and of dryness experienced by such dry-growing mosses.

Here, then, *Adineta*, in turn, has the advantage, for, with many others of the *Bdelloida*, it can protect itself from the effects of evaporation. When the species was first described by Mr. Davis in 1873, he stated, as the result of many trials, that it possessed a surprising tenacity of life in this particular direction, and it is on record that in this it excels even *Philodina roseola*, another noted victim of artificial desiccation. It is certain that the experiments by which Mr. Davis tested the vitality and the endurance of this form were far more severe than the conditions to which it would be subjected in moss growing in the most exposed situations.

It may be urged that the same advantages would be enjoyed by *Adineta oculata*, a form remarkably close to *A. vaga* both in structure and in manner of creeping and feeding, yet having two eyes absent in the latter. I have found it but once, and then on weeds from running water from the river Lea, and I have seen it recorded by no other observer than its discoverer, Mr. Milne, who got it from a pool near Aberdeen, or some 500 miles distant.

There is thus some reason to believe that this eyed species is rare, and I think we may infer that its scarcity in pools is (as in the case of *Adineta vaga*, and so far as that scarcity may be real) a result of its inability to swim. I made no experiments with my colony, but the form may be supposed to have a tenacity of life equal to that of *vaga*. Why has it not obtained a like foothold in moss? In his treatise descriptive of *Callidina symbiotica* (p. 49), Dr. Zelinka gives two reasons for his conclusion that that species leads a life of nocturnal activity and

diurnal rest:—the first is, that, wet weather excepted, the mosses in which it lives are at their maximum of dampness during the night as a result of dewfall, and the second, that that species has no eyes. Mr. Percy Thompson has also suggested, *apropos* of some other forms, that a species with eyes, becoming resident in moss, would possibly tend to become a blind form. These three principles, dovetailing into each other as they do, may well account for the absence of *Adineta oculata* from moss-washings. It is sufficiently near to *A. vaga* to suggest that both forms were originally one and the same, that with eyes being possibly the older type, and that the eyes were lost in *A. vaga*, either by its having become a feeder by night, that season being the most favourable in the dry-growing mosses, or because, when living among the wet mosses, it would be in the dark, even while able to be active in hours of daylight.

Returning again to *A. vaga*, I have for some little time thought that there exist two well-marked varieties of the species. I do not say that intermediate forms do not occur, but the majority of individuals belong definitely to the one variety or to the other, and both are frequently present in the same moss. That which I call the var. *major* is usually larger and stouter, with the head broader in proportion, the styles, which protrude just above and to right and left of the anterior edge of the prone face, strong and bold, while the posterior trunk segments are sharply divided from each other. The var. *minor* is altogether slighter, the styles are inconspicuous, while the trunk segments decrease gradually and without break of lateral outline. It occurs much more frequently than the other. I do not know that these points of divergence are so important as to mark the forms as distinct species, but I hope, by breeding them apart, to ascertain whether they are actual races or merely stages of development.

What I term styles are apparently modifications of the membranous flaps, conspicuous in many of the Callidinæ at the tips of the column. They have hitherto been described as hooks, but I think erroneously.

I conjecture that these two forms were known to Mr. Milne, who, writing in 1886, was seemingly unaware that a description of *A. vaga* had been published long before, for, while stating that he had found two other species with coronæ and

manners similar to those of his *oculata*, he refers one, it is true with much misgiving, to the *Callidina bidens* of Gosse, and states of the other simply that it is distinct, all three forms having two teeth on each ramus. He considers that Ehrenberg's figures of *Callidina* indicate species with a similar formation of the ciliary organs, and to show that Continental observers were not themselves clear upon the point, I find in Dr. Zelinka's treatise (p. 56) a comparison of definitions by other writers of the genus in question. Among them is one by Eyferth, in "Simplest Forms of Life," published in 1878. I translate one sentence only: "Column and ciliary organ soldered to an acorn-shaped (viewed from above), weakly ciliated, outstretched head."

Upon this Dr. Zelinka remarks that, "according to Eyferth, the column is always outstretched and with the ciliary organs soldered to an acorn-shaped head," a representation which, he proceeds, is only to be explained by the author having either never watched a living *Callidina* for a time, or that he has wrongly understood what he has seen. The criticism is an unfortunate one. Eyferth's words describe *Adineta vaga* very closely, and as, in those days, every Bdelloid, which had no eyes, was called a *Callidina*, it is not surprising that he should have assigned its peculiarities to the genus. But it is surprising to me that Dr. Zelinka himself should not have seen *A. vaga*, after his long researches on moss-dwelling *Callidinæ*, but, beyond including Mr. Davis' article in his Bibliography of the Rotifera, he makes no reference to the species, although discussing the relative characters of several other and earlier described forms. I can only infer that *vaga's* geographical distribution does not extend to Bohemia.

I have now to introduce to you a third species, which I propose to name

*Adineta clauda* (n. sp.).

*Sp. Ch.*: Outline maggot-like, segments coarsely marked; trunk with lateral longitudinal skinfolds. Head as broad as long, only partly protruding from neck segments. Foot short, thick, apparently abruptly truncate, and ending in broad, sucker-like disc. Second foot-joint a mere skinfold, furnished posteriorly with a row of about ten small, fleshy, papilliform lobes of varying size. Eyes absent.

The great divergence of this species from the Adinetæ already known ought, perhaps, to entitle it to be placed in a new genus, but in the anticipation of further variations from the type being found, I prefer to postpone any definition of suitable generic characters. There is little to add to the specific characters detailed. The sucker-like foot seems to link the species to *Discopus*, the remarkable marine parasitic genus. It appeared to consist of one stout upper joint, ending in a circular disc, which was applied to the glass, a second joint being represented by a mere skinfold, having the lateral and dorsal (*i.e.*, posterior) margins furnished with ten small processes, in place of the usual spurs; while from the centre of the disc were pushed out momentarily, in the act of taking hold, the usual small lower foot-joints. The animal seemed to have no power of rapid movement, but slowly extended and clumsily crawled about, without a trace of the gliding motion so noticeable in the other species, and this halting awkward gait has suggested the specific name assigned to it. The mastax was rather small and appeared to have two teeth on each ramus. The skin on the ventral side of the neck seemed always to partially cover the face, and was prominent and ridge-like, somewhat hard and rough on the edge. In feeding there seemed a distinct scraping of the food surface, the central line of the face being lifted and made concave, and the roughened edges of the neck-skin approaching each other funnel-wise, much more distinctly than I have seen it in *A. vaga*.

Length, about  $\frac{1}{105}$ th inch.

Habitat, moss.

For this species I am indebted to a fellow-member of this Club, Mr. G. S. Marryatt, who very courteously offered to procure for me some liver-mosses, and who sent me a quantity of various descriptions from Garelochhead, N.B., in the spring of this year. One specimen only was found, and, unfortunately, my opportunities for its examination were small, as I failed to keep it more than a week, and it was very averse to the needful illumination.

#### DESCRIPTION OF FIGURES. PLATE XI.

1. *Adineta clauda*, dorsal view.
- 1a. Ventral aspect of head.
- 1b. Ventral aspect of foot.